



Radius of Fiber and Axis Formulas

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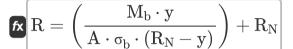




List of 16 Radius of Fiber and Axis Formulas

Radius of Fiber and Axis

1) Radius of centroidal axis of curved beam given bending stress



Open Calculator 🗗

ex

$$89.72787 \text{mm} = \left(\frac{245000 \text{N*mm} \cdot 21 \text{mm}}{240 \text{mm}^2 \cdot 53 \text{N/mm}^2 \cdot (83.22787 \text{mm} - 21 \text{mm})}\right) + 83.22787 \text{mm}$$

2) Radius of centroidal axis of curved beam given eccentricity between axis

fx
$$m R = R_N + e$$

Open Calculator

- 3) Radius of centroidal axis of curved beam of circular section given radius of inner fiber

$$m R = R_i + rac{d}{2}$$

Open Calculator 🛂

$$\boxed{\texttt{ex}} 86 \text{mm} = 76 \text{mm} + \frac{20 \text{mm}}{2}$$

- 4) Radius of centroidal axis of curved beam of rectangular section given radius of inner fiber
- $R = R_i + rac{y}{2}$

Open Calculator 🗗

- $86.5 \text{mm} = 76 \text{mm} + \frac{21 \text{mm}}{2}$
 - 5) Radius of inner fiber of circular curved beam given radius of neutral axis and outer fiber
- $\left| \mathbf{R}_{\mathrm{i}} = \left(\sqrt{4 \cdot \mathrm{R}_{\mathrm{N}}} \sqrt{\mathrm{R}_{\mathrm{o}}}
 ight)^{2}
 ight|$

Open Calculator

- $\boxed{71.36707\mathrm{mm} = \overline{\left(\sqrt{4\cdot83.22787\mathrm{mm}} \sqrt{96\mathrm{mm}}\right)^2}}$
- 6) Radius of inner fiber of curved beam given bending stress at fiber
- $\left| \mathbf{R}_{\mathrm{i}} = rac{\mathrm{M}_{\mathrm{b}} \cdot \mathrm{h}_{\mathrm{i}}}{\mathrm{A} \cdot \mathrm{e} \cdot (\sigma_{\mathrm{b}} \mathrm{i})}
 ight|$

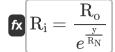
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- $= \frac{245000 \text{N*mm} \cdot 37.5 \text{mm}}{240 \text{mm}^2 \cdot 6.5 \text{mm} \cdot 78.5 \text{N/mm}^2}$
- 7) Radius of inner fiber of curved beam of circular section given radius of centroidal axis
- $R_{i}=R-rac{d}{2}$

Open Calculator



8) Radius of inner fiber of rectangular curved beam given radius of neutral axis and outer fiber



Open Calculator 🗗

9) Radius of inner fibre of curved beam of rectangular section given radius of centroidal axis

$$extbf{R}_{i} = R - rac{y}{2}$$

Open Calculator

10) Radius of neutral axis of curved beam given bending stress

$$R_{N} = \left(rac{M_{b} \cdot y}{A \cdot \sigma_{b} \cdot e}
ight) + y$$

Open Calculator 🗗

11) Radius of neutral axis of curved beam given eccentricity between axis

fx
$$m R_N = R - e$$

Open Calculator

$$= 83.22787 \text{mm} = 89.72787 \text{mm} - 6.5 \text{mm}$$



12) Radius of neutral axis of curved beam of circular section given radius of inner and outer fibre

 $extbf{R}_{ ext{N}} = rac{\left(\sqrt{ ext{R}_{ ext{o}}} + \sqrt{ ext{R}_{ ext{i}}}
ight)^2}{4}$

Open Calculator 🗗

$$85.70831 \mathrm{mm} = \frac{\left(\sqrt{96 \mathrm{mm}} + \sqrt{76 \mathrm{mm}}\right)^2}{4}$$

13) Radius of neutral axis of curved beam of rectangular section given radius of inner and outer fiber

$$R_{N}=rac{y}{\ln\left(rac{R_{o}}{R_{i}}
ight)}$$

Open Calculator

$$\boxed{89.89155 \mathrm{mm} = \frac{21 \mathrm{mm}}{\ln \left(\frac{96 \mathrm{mm}}{76 \mathrm{mm}}\right)}}$$

14) Radius of outer fiber of circular curved beam given radius of neutral axis and inner fiber

$$m R_o = \left(\sqrt{4\cdot R_N} - \sqrt{R_i}
ight)^2$$

Open Calculator

$$\boxed{\texttt{ex}} \left[90.78401 \text{mm} = \left(\sqrt{4 \cdot 83.22787 \text{mm}} - \sqrt{76 \text{mm}}\right)^2\right]$$

15) Radius of outer fiber of rectangular curved beam given radius of neutral axis and inner fiber

fx
$$m R_o = R_i \cdot e^{rac{y}{R_N}}$$

Open Calculator 🗗

$$= 97.81253 \mathrm{mm} = 76 \mathrm{mm} \cdot e^{rac{21 \mathrm{mm}}{83.22787 \mathrm{mm}}}$$





16) Radius of outer fibre of curved beam given bending stress at fiber





$$\mathbf{R}_{\mathrm{o}} = rac{\mathrm{M}_{\mathrm{b}}\cdot\mathrm{h}_{\mathrm{o}}}{\mathrm{A}\cdot\mathrm{e}\cdot(\sigma_{\mathrm{b}}\mathrm{o})}$$

$$= \frac{245000 N^* mm \cdot 48 mm}{240 mm^2 \cdot 6.5 mm \cdot 85 N / mm^2}$$



Variables Used

- A Cross Sectional Area of Curved Beam (Square Millimeter)
- d Diameter of Circular Curved Beam (Millimeter)
- **e** Eccentricity Between Centroidal and Neutral Axis (Millimeter)
- **h**i Distance of Inner Fibre from Neutral Axis (Millimeter)
- **h** Distance of Outer Fibre from Neutral Axis (Millimeter)
- M_b Bending Moment in Curved Beam (Newton Millimeter)
- R Radius of Centroidal Axis (Millimeter)
- R_i Radius of Inner Fibre (Millimeter)
- R_N Radius of Neutral Axis (Millimeter)
- Ro Radius of Outer Fibre (Millimeter)
- y Distance from Neutral Axis of Curved Beam (Millimeter)
- σ_h Bending Stress (Newton per Square Millimeter)
- σ_bi Bending Stress at Inner Fibre (Newton per Square Millimeter)
- σ_ho Bending Stress at Outer Fibre (Newton per Square Millimeter)





Constants, Functions, Measurements used

- Constant: e, 2.71828182845904523536028747135266249
 Napier's constant
- Function: In, In(Number)

 The natural logarithm, also known as the logarithm to the base e, is the inverse function of the natural exponential function.
- Function: sqrt, sqrt(Number)
 A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.
- Measurement: Length in Millimeter (mm)
 Length Unit Conversion
- Measurement: Area in Square Millimeter (mm²)

 Area Unit Conversion
- Measurement: Torque in Newton Millimeter (N*mm)
 Torque Unit Conversion
- Measurement: Stress in Newton per Square Millimeter (N/mm²)

 Stress Unit Conversion





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